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ABSTRACT

A study of 113 graduate students in a college of education explored how readily they would apply their knowledge about transfer of learning to a personally relevant teaching task. One group practiced integration; participants were asked to think about concepts they were learning in terms of the three elements of the integration strategy. A second group practiced encapsulation; participants visualized concepts they were learning. Members of a third group were encouraged to reread and review earlier presented text and apply their own preferred learning strategy to learn concepts within the text. Participants read a short text on general issues of applying classroom learning to work and then answered several multiple-choice questions about the text. They then practiced one of the three strategies and applied it to a new text about the role of transfer. Finally, they took a multiple-choice test to measure their knowledge of the concepts in the text and were asked to apply the concepts to a teaching situation of their choice. The hypothesis was that practicing the integration strategy would cause more transfer. Findings from the one-sample t-tests indicated the participants knew about transfer after reading the passage about transfer and transferred this knowledge to the applied teaching task. There was no evidence of differential transfer effects that resulted from practicing different learning strategies. (Contains 12 references and instruments.) (YLB)

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Do Learning Strategies Affect Adults' Transfer of Learning?

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ED 413 419

Abstract

One-hundred and thirteen graduate students in a College of Education practiced one of three learning strategies prior to reading about transfer of knowledge and then applying what they read to a personally relevant teaching task. The analyses indicated that the participants knew about transfer after reading the passage about transfer and that they transfered knowledge about transfer to the applied teaching task. There was no evidence, though, of differential transfer effects that resulted from practicing different learning strategies.

The task of applying prior knowledge to new situations is generally referred to as transfer of learning (Cormier & Hagman, 1987; Ormrod, 1995; Singley & Anderson, 1989). In a typical transfer scenario, a person learns new knowledge or a skill and then later has an opportunity to generalize that knowledge or skill to a new situation. If the generalization occurs, then we say that the person succeeded in transferring the prior leaming to a new situation. In experimental studies of this phenomenon, researchers have consistently found that participants do not readily transfer leaming to new situations (e.g. Detterman, 1993). In educational contexts, however, even elementary school children transfer reading strategies to new contexts (Pressley, Johnson, Symons, McGoldrick, & Kurita, 1989). In the present study, we were interested in how readily graduate students would transfer their knowledge about transfer to an applied teaching task.

According to one view, transfer will occur if instructors present an overall picture of the materials to the students, provide specific information to support the big picture, and place the material in a number of contexts familiar to students (Ford, 1994; Fox, 1994; Ottoson, 1994). In this study, one group of students practiced a strategy that combined the three elements of big picture, specific instances, and multiple contexts with prior-knowledge activation. This

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strategy is termed integration. The strategy was implemented by asking participants to think about concepts that they were learning in terms of the three elements of the integration strategy.

Several factors have been associated with a failure to transfer (Sternberg & Frensch, 1993). When knowledge is encoded in an overly specific form, it may not be accessible for future use in a different context. When knowledge is organized within a rigid structure it allows little flexibility for application to new situations. Mind set can prevent one from making associations between new situations and one's prior learning. We hypothesized that we could "encapsulate" knowledge in this fashion through the use of an imagery strategy. This strategy, termed encapsulation, was practiced by a second group of students. It was implemented by asking participants to visualize concepts that they were learning. In a control condition, participants were encouraged to simply re-read and review earlier presented text and to apply their own preferred learning strategy in order to learn concepts within the text.

The study consisted of several manipulations, which are summarized next. The materials and instructions that were used in the study are presented in the Appendix. Participants began by reading a short text on general issues of applying classroom learning to work. Following the reading, they answered several multiple-choice questions about the text. They then practiced one of the three strategies described above, and they applied the strategy that they practiced to a new text about the role of transfer in applying classroom learning to work. Following this, they took a multiple choice text to measure their knowledge of the concepts in the text and then were asked to apply the concepts to a teaching situation of their choice. According to Alvermann and Qian (1994) and Pressley et al. (1989), encapsulation (imagery) and integration strategies are both helpful in reading comprehension, thus we did not expect that the strategies would result in differences in concept learning on the second multiple-choice test. For the reasons stated earlier, we predicted that practicing the integration strategy would bring about more transfer than the other two strategies in the applied task.

Method

Materials

The materials consisted of three forms (A, B, and C), each in four parts (see Appendix). Parts 1 and 3 consisted of short texts and multiple-choice questions for assessing participants' reading comprehension. The reading for Part I contained a page of general knowledge on transfer

of learning, and Part 3 contained specific examples of transfer strategies. There were six multiple-choice questions for each of these two parts. Each of the three versions of Part 2 contained a brief description of one of the three learning strategies that was followed by two practice exercises (see Appendix). The practice exercises contained example responses that were generated by participants in a pilot study (see Wang, 1996). Part 4 consisted of instructions for generating an application of the concepts from Part 3.

Participants

The participants were 113 students from eight, intact graduate classes in the College of Education at Texas Tech University. Their ages ranged from 22 to 66 years (mean = 34 years). Fifty-two percent (n = 63) of the participants were females and 43% (n = 48) were males. Their professions (or majors) represented 28 major fields.

Procedure

Each participant received one of the three forms through random assignment. The testing sessions took 30 minutes during regular classroom sessions. All participants began by reading the text in Part 1 and answering 6 multiple choice questions. Following this, in Part 2, they were presented with a strategy, which they practiced. Form A contained the encapsulation strategy exercise, using imagery to encapsulate the key concepts in the text in Part 1. Form B contained the integration strategy, using elaboration to integrate the same key concepts as in Form A. Form C contained instructions to participants to re-read the text and then to use their own strategy to learn the same key concepts as in Forms A and B. The exercises in Part 2 required the participants to evaluate and then to select and to modify one of the four example responses that were provided. They were asked to practice the strategy that had been presented to them. In Part 3, they read a text on transfer and were asked to apply the strategy that they had practiced in Part 2 to the task of learning the concepts in the text. In Part 4, they were asked to apply the concepts from the text in Part 3 to an instructional task of their choice.

Results

Scoring the responses. The response choices in the multiple-choice questions reflected varying levels of knowledge. Point-assignments were predetermined through the consensus of four independent raters (Wang, 1996), as follows: 1 point indicated little knowledge, 2 points indicated some knowledge, 3 points indicated good knowledge, 4 points indicated excellent

knowledge. Parts 2 and 4 consisted of open-ended responses, which were scored using the following criteria: 0 points indicated no response, 1 point indicated no knowledge of the learning strategy (Part 2) or transfer of learning (Part 4), 2 points indicated little knowledge of the learning strategy (Part 2) or transfer of learning (Part 4), 3 points indicated clear knowledge of the learning strategy (Part 2) or transfer of learning (Part 4), 4 points indicated good knowledge of the learning strategy (Part 2) or transfer of learning (Part 4), 5 points indicated excellent knowledge of the learning strategy (Part 2) or transfer of learning (Part 4). Multiple-choice and open-ended responses were scored independently by 3 trained raters (see Wang, 1996). The means of the ratings were used as the participants' scores.

Statistical analyses. A one-sample *t*-test was used to assess participants' performance on the multiple-choice items in Parts 1 and 3. For the twelve items in Parts 1 and 3, participants exceeded a baseline score of 24, based on assigning 2 points to each question (see section on scoring), $M = 37.84$, $SD = 4.07$, $t\,(108) = 35.56$, $p < .05$.

To evaluate how well the participants learned the strategies and then transferred learning, two separate one-sample t-tests were used to compare participants' mean scores from Part 2 and Part 4 to a baseline value of 2 (see the section on scoring). In Part 2 participants' mean scores ($M = 2.57$) were significantly better than a baseline mean score of 2, $t\,(103) = 5.46$, $p < .05$. A similar result held in Part 4 ($M = 2.45$, $t\,(97) = 5.08$, $p < .05$). (The difference in degrees of freedom for the two *t*-tests was due to incomplete data.) These two results established that participants actively engaged in the practice and transfer tasks and responded in ways that indicated "clear knowledge" of the strategies and of transfer.

The major question in this study was whether transfer of learning is affected by the learning strategy that a person applies during learning. An analysis of covariance was applied to the transfer scores from Part 4, using the practice scores from Part 2 as a covariate. The independent factor was strategy (encapsulation, integration, review). There were no significant differences between conditions, $F\,(2, 71) = 0.38$. Thus, there was no evidence for differential effects of these learning strategies on transfer of learning.

Discussion

The findings from the one-sample t-tests indicated that in a normal classroom environment participants were able to learn the concepts associated with transfer and that they applied these to a practical task. This supports Anderson, Reder, and Simon's (1996) suggestion that negative results in transfer studies may be the result of using contrived problem-solving tasks in artificial environments. The lack of significant differences in transfer performance as a function of learning strategies fails to support the claims of Ford (1994), Fox (1994), and Ottoson (1994), who suggested that transfer of learning depends on the combination of three elements: understanding the big picture, knowing specific instances, and placing the knowledge in multiple contexts. Participants who were in the integration condition received practice with these elements, but participants in the other conditions did not. However, there was no significant difference in the level of transfer across these conditions. One factor that may have limited the differences that emerged between the strategy conditions may have been the short delay between learning about transfer and then transferrng that knowledge to a real task. In subsequent studies it may be helpful to test various delays between learning and transfer in order to more effectively uncover the effects of differences in learning strategies. It is also possible that the measure of transfer in Part 4 largely reflected participants' knowledge of transfer and not their actual transfer of learning to the applied task. Thus, in further studies, it would be informative to vary the content of the transfer task.

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Part I **QUESTIONNAIRE**

Please first read the following section before reading and answering the multiple-choice items that follow

Applying Classroom Learning to Work (Part 1)

In recent years, the number of continuing education courses for adult professionals has increased to meet our need to remain professionally competent in a rapidly changing society. We can no longer rely completely on our daily experiences to remain current in our professional skills and knowledge. As the number of courses increases, we become concerned with the value of the courses. We want to know if the courses are really teaching us what we need to know in our respective fields. Are we using what we learned on our job?

In 1988, Baldwin and Ford reviewed articles on the effect of American training in the work place They found that American companies spent about $100 billion annually to train their workers and no more than 10% of the training was actually used on the job. This means that businesses waste $90 billion annually in training workers. The questions are, why is this happening and how can we fix it?

The findings on applying classroom learning to real world situations are diverse and at times contradict one another. They do not give clear and definite answers. Our problem is not that there is a lack of a solution, but that there are too many. How can we find the right solutions among so many with contradictory results? To resolve this issue, I adopt a familiar strategy of looking at the repeated pattern of agreements among the studies.

I found some ideas that many seasoned professionals could have told us. For us to apply knowledge and skills to a task, we must first learn the knowledge and skills. Acquiring concepts, however, does not automatically ensure that we will use them. Studies suggest that it is important for us not only to learn the appropriate knowledge and skills but also to learn them in ways that encourage future use. A promising method for acquiring new concepts for application is to learn the abstract principles and the concrete examples of the concepts in multiple contexts.

Evaluation for **Part I**.

Please read the following items **only when you are ready to answer them**. When answering the items, do not refer back to the reading. **Please do not write on this form.**

1. Americans spend about $100 billion annually to train workers and no more than 10% of the training is actually used on the job. The purpose of this statement is to show that
   A. American business is committed to training their workers.
   B. failure to apply training to work settings is wasting American financial resources.
   C. workers can apply only 10 % of what they learned.
   D. it is crucial to understand how individuals learn so they can apply what they have learned.

2. To select the right solutions among many, I adopt a familiar strategy of looking at the repeated pattern of agreements . . . . The strategy is to look for the
   A. identical results from similar studies.
   B. findings from researchers with the same philosophical approaches.
   C. common practices among professionals.
   D. overlapping commonalities of the findings among diverse studies.

3. Knowing a concept, however, does not automatically ensure that we will use it. The idea behind this is that
   A. we need more than just knowing the concept.
   B. knowing a concept does not help us to apply it to a new situation.
   C. some of us believe that if we know a concept, we will use it.
   D. we need to practice in addition to knowing the concept.

4. A promising learning method for application is to use
   A. integration, elaboration, and visualization.
   B. a combination of teaching concepts and skills.
   C. rote memorization and repeated problem solving practice skill.
   D. abstract principles, concrete examples, and multiple contexts.

5. The problem is not that there is a lack of solutions, but that there are too many . . . . This means that
   A. our problem is one of selection, rather than one of discovering new solutions.
   B. we need to find a criterion for selecting the appropriate solution.
   C. our problem is not as hopeless as we originally thought.
   D. it is a significant issue, because so many researchers are interested in it.

6. We can no longer rely completely on our daily experiences to remain current in our professional skills and knowledge. This statement provides the reason for
   A. incompetence in our professional work force.
   B. rapid changes in technology and information in our society.
   C. the increase in number of courses in continuing education.
   D. why professionals should to attend classes.

Part II Learning method exercise **Form A**

One learning method that helps to improve one's recall in reading is **visualization**. This is done by creating a visual image that represents the concept to be remembered. The image does not necessarily have to be accurate. It only needs to be helpful for future recall. Therefore, it can be **funny to you and nonsensical to other people**.

Following is a list of five key sentences from the reading in Part I. Visualize each sentence and write down what you see in Part II of the answer sheet. **Please do not write on this form.** Now you may refer back to Part I if you wish, but do not change your answers to the multiple-choice items that you completed on the previous page. Use the following example to help you create a visual image that will aid in recall of the reading material in Part I.

Example: If you were to apply the visualization strategy to the sentence, " knowing a concept does not automatically ensure that we will use it," you might first see yourself sitting in the driver's seat for the first time, totally lost of what to do even though you have hours of lecture on driving.

1. We can no longer rely completely on our daily experiences to keep current in our professions.

2. Americans spend about $100 billion annually to train workers and no more than 10% of the training was actually used on the job.

3. The problem is not that there is a lack of solutions, but that there are too many.

4. To resolve this issue, I adopt a familiar strategy of looking at the repeated pattern of agreements among the studies.

5. A promising method for acquiring new concepts for application is to learn the abstract principles and the concrete examples of the concepts in multiple contexts.

Part II Learning method exercise
Form B

A promising learning method that encourages us to apply what we have learned is to integrate abstract principles with concrete examples in multiple contexts. Abstract principles provide an outline of the concepts and their relationships to one other. Concrete examples fill in the details and evidences for supporting the abstract principles. Offering students a number of applications for the abstract concepts with specific examples in different situations allows them to see a larger scope of possibilities for applying what they have learned for future use.

Following are five key sentences from the reading in Part I. For this exercise apply the learning strategy of integration of the three elements (abstract principles, concrete examples, and multiple contexts) to the sentences below. **First** restate each sentence into an abstract principle, **then** provide concrete examples from your own experience to support the principle. Be sure to give a number of examples in different situations. In Part II of the answer sheet write down your responses. **Please do not write on this form.** Now you may refer back to Part I if you wish, but do not change your answers to the multiple-choice items that you completed on the previous page. Use the following example to help you to apply the three components of the learning strategy to remember the reading material from Part I.

Example: If you were to restate, "knowing a concept does not automatically ensure that we will use it," you might state that "in order to use a concept, we need more than just simply knowing the fact of the concept." To elaborate on this abstract concept, you might give concrete examples, such as, learning to drive a car, learning to speak, or learning to write. Just knowing the facts of driving is not enough. When we first learn to drive, we need to have the actual experiences of driving under different weather conditions, on different roads, and with different cars.

1. We can no longer rely completely on our daily experiences to keep current in our professions.

2. Americans spend about $100 billion annually to train workers and no more than 10% of the training was actually used on the job.

3. The problem is not that there is a lack of solutions, but that there are too many.

4. To resolve this issue, I adopt a familiar strategy of looking at the repeated pattern of agreements among the studies.

5. A promising method for acquiring new concepts for application is to learn the abstract principles and the concrete examples of the concepts in multiple contexts.

Part II Learning method exercise **Form C**

In the reading, it is stated that "knowing a concept does not automatically ensure that we will use them." We need to learn the concept with the intention to apply them in the real world situation. For this exercise, use a learning method that has worked for you when you have to know a concept in order to apply it to a real situation.. Now you may refer back to Part I if you wish, but do not change your answers to the multiple-choice items that you have just completed.

Following are five key sentences from the reading in Part I. Apply the learning method that works for you to each sentence below. Write down in Part II of the answer sheet your responses. **Please do not write on this form.**

1. We can no longer rely completely on our daily experiences to keep current in our professions.

2. Americans spend about $100 billion annually to train workers and no more than 10% of the training is actually used on the job.

3. The problem is not that there is a lack of solutions, but that there are too many.

4. To resolve this issue, I adopt a familiar strategy of looking at the repeated pattern of agreements among the studies.

5. A promising method for acquiring new concepts for application is to learn the abstract principles and the concrete examples of the concepts in multiple contexts.

Part III

Please first read the following section before reading and answering the five-item multiple choice questionnaire that follows. While reading this section, please **use the learning method with which you have just practiced**.

Applying Classroom Learning to Work (Part 2)

The conclusion of the last reading lists three components of a learning method (abstract principles, concrete examples, and in multiple contexts). These three components of learning are incorporated in several professional training programs (i.e., those for doctors, nurses, and teachers). Studies show that to apply knowledge and skills to real situations it is important to understand abstract principles.

A good example is Biederman and Shiffrar's 1987 study of teaching beginners to identify the sex of day-old chicks. The task is so difficult that it usually takes years to learn in an apprentice setting. When Biederman and Shiffrar used the abstract principles in their study, they found that their participants reached, in only 20 minutes, a level that usually takes years of practice. Other studies show that it is important to teach specific and concrete examples to achieve future use of the concepts. Case studies in professional fields involve frequent use of concrete examples. The last component is learning in multiple contexts, which can be best illustrated by internships in professional training. The literature suggests that not only are these methods, when used individually, helpful in promoting learning for application, but they are helpful when used in combination. In recent years, several studies have shown that a combination of using abstract principles with specific concrete examples increases the frequency of future application. An example of combining all these elements is when interns learn theories and case studies along with their clinical experiences.

This study does not introduce new methods of learning but systematically reexamines well- known and practiced methods to give more credibility to the methods and to uncover why they are not widely used. Your participation as an educator and/or as a learner is part of the reexamination process.

Reading evaluation for **Part III**

Please read the following items **only when you are ready to answer them**. When answering the items, do not refer back to the reading. **Please do not write on this form.**

Please write on the answer sheet **the learning method**, which **you used** while reading Part 2 of the Readings.

1. According to the reading, what types of learning are incorporated in many professional training methods?
   A. integration, elaboration, and visualization.
   B. abstraction, concrete illustration, and different situations.
   C. combination of teaching abstract concepts and specific skills.
   D. repetition of facts and practice of problem solving.

2. An example of teaching concrete experiences in the readings is
   A. practicum in student teaching.
   B. case study in the professional fields.
   C. video interaction trainings in driving.
   D. lab for science classes.

3. The purpose for your participation is to help me in
   A. finding ways to increase applications from classroom learning.
   B. exploring public opinions on the topic of transfer.
   C. confirming the need for continuing education courses.
   D. reevaluating some existing learning methods.

4. Internship is an example of teaching
   A. abstract instructions to nurses.
   B. concrete experiences for medical students.
   C. in actual professional environment.
   D. integration of abstraction and concrete examples.

5. Biederman and Shiffrar's 1987 study teaches beginners to identify the sex of day-old chicks. This study gives a good illustration of teaching
   A. abstract principles.
   B. concrete examples.
   C. in multiple contexts.
   D. in combination of A and B.

Part IV. This should take you about 10 minutes.

This is an application activity for you to apply the concepts, which you have read and learning method, which you have practiced. Please design a workshop using all the concepts you have learned from Parts I to III if possible. It is an all-day workshop with 15 to 20 returning adult students on a topic of your interest. Write a brief description of your workshop that includes the following areas. **Please do not write on this form**.

Areas to be included in your responses for **Part IV**.

- The key concepts, the purposes, and the applications for your workshop.
- The learning methods and the reasons for selecting them.
- Elaboration on the key concepts for application in the real world situations.
- Evidences from your students that will support your success in teaching for applications.